Detection and Control of Epidemic Yellow Fever

Epidemiology

CDC
Centers for Disease Control and Prevention

Yellow Fever in Africa

- 1st documented in 1778
- Tens of thousands of deaths
  Hundreds of thousands of cases
- Epidemics were eliminated by vaccination in Francophone Africa for a time
- Many countries at risk
- Cannot predict where next epidemic will be

Yellow Fever

- **Acute viral infection**
- **Transmitted by mosquitoes**
- **Endemic and epidemic in Africa**
- **Case fatality rate is high in classic yellow fever**
- **No curative medical treatment**
- **Preventable by vaccination**

Epidemics of Yellow Fever

- **High death rates**
- **Great social and economic disruption**
- **Controlled by**
  - mass vaccination
  - elimination of mosquito vector
- **Occur periodically**
  - about every 10 years
  - when a non-immune population is built up

Yellow Fever

- **Endemic Yellow Fever**
  - **sporadic cases**
  - **exposure to sylvatic yellow fever, or**
  - **after an epidemic**

- **Epidemic Yellow Fever**
  - **sudden onset of many clinically compatible cases**

Sylvatic Yellow Fever

Forest monkey - mosquito cycle

- **Transmitted by treehole breeding mosquitoes**
- **Cases are sporadic**
- **Humans who work in or visit forest**

Urban Yellow Fever

Aedes aegypti - transmitted yellow fever

- **Transmitted by** *Aedes aegypti* **mosquitoes**
- **Occurs in villages and towns**
- **Cycle = "mosquito to human to mosquito to human...."**

Environmental Factors

- **Heavy rainfall - many mosquitoes**
- **Dry areas - store water close to home**
- **Mosquito breeding sites**
  - water storage containers
  - tires
  - refuse
  - natural = tree holes, foot prints, in plants
- **Monkeys**

Mosquito Vector Factors

- **Not all mosquitoes transmit YF**
- ***Ae. aegypti* is usually primary vector in epidemics**
  - avid human biter
  - lives close to people
  - should know distribution
- **Forest mosquitoes bite humans who enter the forest**
- **Consult specialists for vector control measures**

Host Factors

- **Immune status most important factor**
- **People become immune through**
  - vaccination
  - natural infection
- **Large population of non-immunes = risk of epidemic**
- **Behaviors**
  - visit or work in or near forest (men)
  - at home, near peri-domestic *Ae. aegypti* (women, children)

Areas at Risk of Yellow Fever

- **Areas where there were YF epidemics in the past**
- **People work / visit in forest where sylvatic YF occurs**
- **People come from areas of YF transmission**
- **These factors are present:**
  - mosquitoes that transmit YF
  - a long rainy season
  - forested areas with monkeys

Public Health Program
for Yellow Fever

1. **Prevention Program**
   - **based on vaccinating susceptibles**
   - **add YF vaccine to EPI program**

2. **Plan for Responding to Epidemics**
   - **early detection of epidemics**
   - **prompt mass vaccination of high risk groups**
   - **mosquito control measures**
   - **provision of funding and resources**

Clinical Yellow Fever

- No protracted carrier stage
- No direct person to person contact
- 3-6 day incubation period
- Patient is viremic 3-6 days after onset of fever
- Wide clinical spectrum of disease
- Easily confused with other causes of fever

Spectrum of Clinical Illness

- **Undifferentiated febrile illness**
  - resembles many other fevers

- **Classic Yellow Fever**
  - fever, vomiting, epigastric pain
  - prostration, dehydration
  - scleral icterus
  - renal and hepatic abnormalities
  - hemorrhagic tendency
  GI bleeding - black vomitus

Phases of Clinical Yellow Fever

- **Phase 1 - non specific febrile illness**
  - viremic patient, but diagnosis difficult
- **Period of Remission**
  - brief clinical improvement
  - 3rd-4th day after onset
- **Phase 2 - "intoxication"**
  - hepatic and renal dysfunction
  - bleeding
- **50% case fatality rate for severe YF**

Suggestive Physical Signs

- **Fever is almost always present**
- **Faget's sign - relative bradycardia**
  - slow heart rate in relation to fever
- **Conjunctival congestion**
- **Flushing of face and neck**
- **Tongue reddened at end and margins**
- **Minor gingival hemorrhages**

Diagnosis of Yellow Fever

- **Clinical Diagnosis not easy**
  - **very difficult early in outbreak**
- **Definitive diagnosis requires laboratory**
  - **serology**
  - **virus isolation**
  - **malaria may be identical to early yellow fever**
  - **many causes of undifferentiated fever**
- **Maintain high index of suspicion for**
  - **fevers not responsive to antibiotics or antimalarials**
  - **increased admission and death rates from hepatitis**
  - **reports of many deaths following fevers**

Purposes of Surveillance

- **Detect epidemics early**
- **Estimate how many cases and deaths**
- **Assess extent of the epidemic**
- **See if an epidemic is spreading, and where**
- **Plan distribution of supplies and staff**
- **Determine effectiveness of control measures**

Effective Surveillance

- **Essential to recognition of epidemics**
- **Depends on clinical diagnosis of cases**
- **Depends on laboratory confirmation**
- **Requires effective reporting system**

Surveillance Case Definitions

- **SUSPECTED CASE =**

  Sudden onset of fever, followed by jaundice

  AND one or more:

  - bleeding in the mouth

  - black vomitus

  - death

- **CONFIRMED CASE =**

  Suspected case AND

  - virus isolation from blood or liver OR

  - positive neutralization or IgM capture

Report Suspected YF Cases Urgently

- Report a single suspected case immediately
- Report a suspected epidemic immediately
- Do not wait for confirmation
- Take informal reports seriously
  - from travelers and merchants
  - from the public
  - from news reports

How To Report Suspected Yellow Fever

- **Report to the designated level**
- **Use most rapid and reliable means available**
  - **telephone**
  - **radio**
  - **FAX or TELEX**
  - **telegram**
  - **courier (Ministry or informal)**
- **When using informal or unsure means, send a back-up report as well**

Zero Reporting

- **"Zero reporting" = send a report even if no cases or deaths occurred**
- **Distinguishes between areas**
  - that really had no cases
  - that did not send a report
  - from which the report did not arrive
- **Helps evaluate effectiveness of vaccination campaign**